# ES3

USER MANUAL
Version: 0.4

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## CONTENTS


**1 Introduction ..... 5**

1.1 Purpose ..... 5
1.2 Scope ..... 5
1.3 Glossary ..... 6

**2 Product description ..... 7**

2.1 ES3 General Specifications ..... 7
2.2 Scope of material Included ..... 8
2.3 ES3 components ..... 8
2.3.1 Transducer/Electronics Housing (Sonar Head) ..... 8
2.3.2 Power Data Interface (PDI) ..... 9
2.3.2.1 Power Switch ..... 9
2.3.2.2 Power connector ..... 9
2.3.2.3 Power LED ..... 9
2.3.2.4 Ethernet connectors ..... 10
2.3.2.5 Ethernet LED ..... 10
2.3.3 Beam Steering and ES3 control software ..... 10

**3 Installation ..... 11**

3.1 Software installation ..... 11
3.1.1 Network Settings for ES3 processing PC ..... 11
3.1.2 Network Settings for Data Acquisition PC ..... 11
3.2 Setting up the equipment ..... 12
3.3 Powering up the equipment ..... 13
3.4 Transducer installation ..... 13
3.4.1 Over the Side Transducer Installation ..... 13

**4 ES3 software ..... 14**

4.1 Introduction: ..... 14
4.1.1 Range ..... 14
4.1.2 Gain ..... 14
4.1.3 Display Gain ..... 15
4.1.4 File ..... 15
4.1.4.1 Data From ..... 15
4.1.4.2 Record Start ..... 15
4.1.4.3 Playback ..... 16
4.1.4.4 Fast Playback ..... 16
4.1.4.5 Copy Start ..... 16
4.1.4.6 Convert .837 Sonar Files to .83P Format ..... 16
4.1.4.7 Convert .837 Sonar Files to .83B Format ..... 16
4.1.4.8 Save Screen ..... 16
4.1.5 Color Table ..... 16
4.1.6 Set-up ..... 17
4.1.6.1 IP Address ..... 17
4.1.6.2 Units ..... 18
4.1.6.3 Automatic File Names ..... 18
4.1.6.4 Automatic File Name Type ..... 18
4.1.6.5 Frequency ..... 18
4.1.7 Options ..... 18
4.1.7.1 Grid ..... 18
4.1.7.2 Sector Size ..... 18
4.1.7.3 Beam width ..... 19
4.1.7.4 Beams ..... 19
4.1.7.5 Averaging ..... 19
4.1.7.6 Remove Background ..... 19
4.1.7.7 Gain Equalization ..... 19
4.1.7.8 Track Plotter ..... 19
4.1.7.9 Sidescan Window ..... 19

4.1.7.10 Echo Sounder Window ..... 20
4.1.7.11 Sweep Window ..... 21
4.1.7.12 Signal Level ..... 21
4.1.7.13 Diagnostics ..... 22
4.1.8 Com Ports ..... 22
4.1.8.1 GPS ..... 22
4.1.8.2 MRU ..... 22
4.1.8.3 Sound Velocity Input ..... 22
4.1.9 Mode ..... 24
4.1.10 Profile Setup ..... 25
4.1.10.1 Profile Point Display ..... 25
4.1.10.2 Profile Point Detection ..... 25
4.1.10.3 Profile Point Filter ..... 25
4.1.10.4 Advanced Filter Settings ..... 25
4.1.11 Profile Waterfall Display ..... 28
4.1.11.1 Profile Tilt Angle ..... 28
4.1.11.2 Display Altitude ..... 28
4.1.11.3 Grid Type ..... 28
4.1.12 Data Output Setup ..... 29
4.1.13 Video ..... 29
4.1.14 About ..... 29
**5 Operating Instructions ..... 30**
**6 Troubleshooting ..... 31**
**Appendix A. CABLE CONNECTIONS: ..... 32**
**Appendix B. Sound Velocity Input String ..... 33**
**Appendix C. Configuring Digibar Pro to output data in real time ..... 34**
**Appendix D. Motion Reference Unit output string ..... 35**
**Appendix E. Transducer Dimensions ..... 36**

# 1 INTRODUCTION

The ES3 Multibeam echo sounder is a portable easy to use system that will collect bathymetry over a 120° swath at a water depth of up to 60meters. The small size of the ES3 makes it easy to install on vessels of opportunity and its ease of operation makes it an excellent choice for surveyors who want to make the technical transition from single beam echo sounding to multibeam surveying.

To make learning about the features of the ES3 easy to follow, this document is structured as a step-by-step manual. The manual covers the ES3 as a product, it provides instructions on how to install the software and the hardware, suggestions on how to use all the different control settings, how to perform certain critical procedures, how cables are wired to their connectors, and some simple troubleshooting tips.

## 1.1 Purpose

The purpose of this document is to explain the features and operation of the ES3.

## 1.2 Scope

The scope and content of this document is focused on providing useful information to the end-user.

## 1.3 Glossary

| | |
|---|---|
| DGPS | Differential Global Positioning System |
| NMEA | National Marine Electronics Association |
| VDC | Volts Direct Current |

# 2 PRODUCT DESCRIPTION

## 2.1 ES3 General Specifications

***Frequency:***
- 240 kHz

***Swath Width*** (Nominal Beam Geometry):
- 120° x 3° Transmit
- 120° x 3° Receive

***Effective Beam Widths*:***
- Narrow – 0.75°
- Medium – 1.5°
- Wide – 3.0°

***Number of Beams**:***
- Default – 480
- Selectable – 240, 120

***Range Resolution:***
- 0.02% of Range

***Range:***
- 60m (197ft.) water depth
- 100m (328ft.) slant range

***Minimum Detectable Range:***
- 0.5m below transducer

***Ping Rate (PRF)***
- 12 Hz at 20m range (Processor and # of real-time beams selected dependent)

***Maximum Operating Depth:***
- 10m below the surface (submersion depth)

***Interface to PC:***
- Ethernet (10 base-T) using TCPIP

***Maximum Cable Length:***
- 100m using CAT5-e

***Connector:***
- Underwater wet-mateable 8 conductor Subconn at transducer end, 8 pin Circular MS type connector at J-Box end

***Power Supply:***
- 24 VDC nominal (9 to 30 VDC range using PDI)
- Power Dissipation <25 Watts total

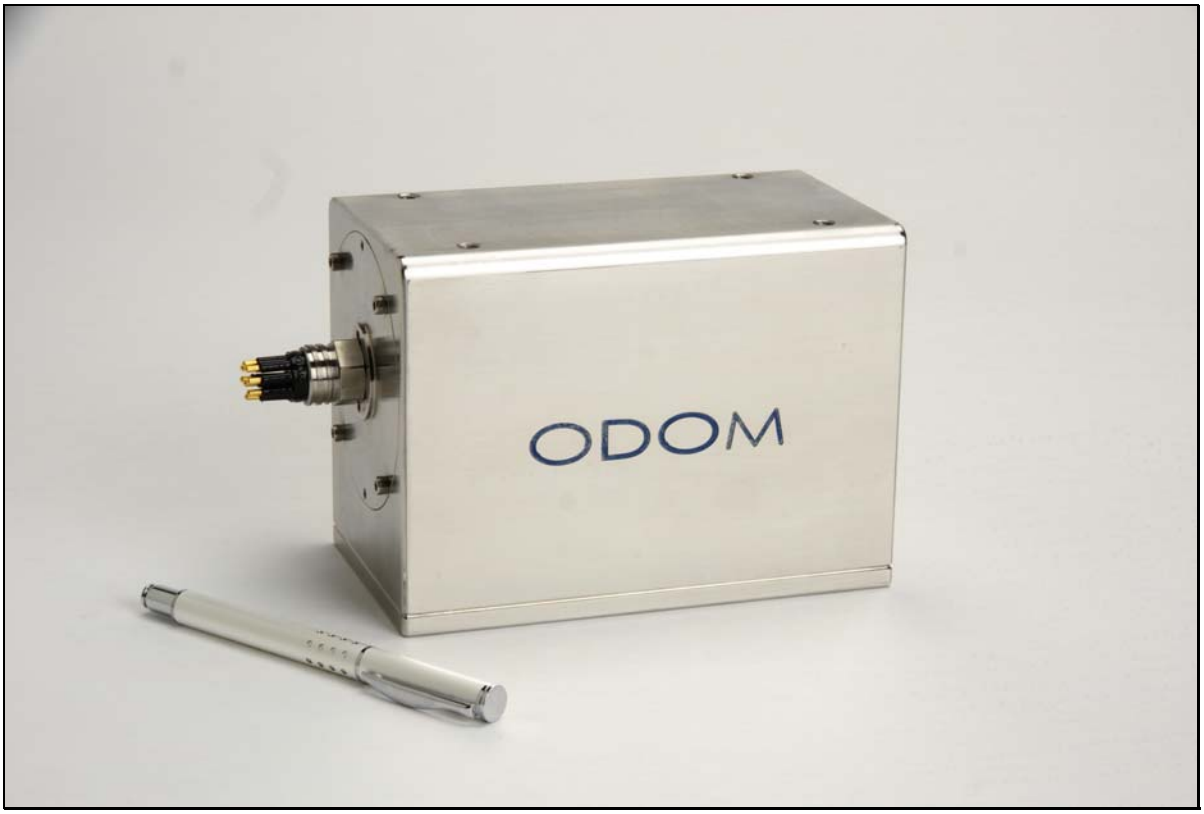
***Dimensions:***
- 162mm (6.3”) L, x 117mm (4.62) H, x 92mm (3.63) W

***Weight:***
- 8.2kg (18 lb) in air

***Material:***
- Stainless Steel Housing
- Urethane Transducer Face

***Power/Data Interface (PDI):***
(Included in ES3 scope of supply)
- Three (3) port Ethernet switch (ES3, Data Acquisition PC, and spare)
- 9 to 30 VDC input range
- Dimensions: 178 mm (7 in.) W x 102 mm (4 in.) H x 178 mm (7 in.) L

* Effective Beam Widths include some overlap between adjacent beams.
** Acoustic data is collected at full resolution for off-line playback/display. The number of beams displayed and output in real time is operator selectable. The number selected inversely affects the system Ping Rate (PRF).




## 2.2 Scope of material Included

The ES3 is supplied with the transducer/electronics housing referred to in this document as the sonar head, a Power/Data Interface, power cable, transducer cable, Ethernet cables and software on CD.

* Important Note: A computer is required to run the software that is supplied with the ES3. This computer is in addition to the computer required for the data acquisition system. Only the software required by the ES3 should be allowed to run on the computer during data acquisition. Windows 2000 or Windows XP are compatible operating systems for this software.

## 2.3 ES3 components

### 2.3.1 Transducer/Electronics Housing (Sonar Head)

The ES3 transducer/electronics housing or Sonar Head, is the central component of the system. The ES3 Sonar Head is connected to the supplied Power Data Interface (PDI) via an underwater connector/cable combination. The stainless steel Head can be mounted in the hull of the vessel or over-the-side on a portable pole mount

arrangement. Particularly in hull mounted situations, great care should be taken so that very few air bubbles pass across the face of the transducer when the vessel is underway at survey speed. If mounted over-the-side, the mounting poll should not be allowed to vibrate excessively or to shift position during the survey. The head should be oriented so that the underwater connector is aft.

### 2.3.2 Power Data Interface (PDI)

The PDI supplied with the ES3 interfaces the computers on the vessel to the Sonar Head through an Ethernet Switch and supplies 24 VDC to the transducer. Internally the PDI houses an Ethernet switch and a wide input range regulated 24 VDC output switching power supply.

#### 2.3.2.1 Power Switch

The power switch applies DC power (9 to 30 VDC) to the internal switching power supply which powers the Ethernet Switch inside the PDI and the ES3 Sonar Head via the power/data cable.

#### 2.3.2.2 Power connector

The PDI contains an internal power supply circuit that regulates the DC power applied to the ES3. The input power requirement for the PDI is 9-30 VDC. The power consumption of the ES3 PDI and transducer is approximately 15 Watts.

#### 2.3.2.3 Power LED

When the ES3 PDI is turned on, a Red LED will illuminate to indicate that the internal systems have powered up successfully. The Red LED is located next to the power switch.

#### 2.3.2.4 Ethernet connectors

There are three Ethernet connectors available on the PDI. The connector labelled Processing PC should be connected to the computer running the ES3 beam forming software. The connector labelled Data Acquisition PC should be connected to the computer running the Hydrographic data acquisition software. A spare Ethernet port is provided in order to connect additional computers to the ES3 system.

#### 2.3.2.5 Ethernet LED

The Link indicator on the ES3 indicates that the ES3 sonar head is connected and it is transmitting data to the Ethernet switch in the PDI.

### 2.3.3 Beam Steering and ES3 control software

The control software supplied with the ES3 is used to set all of the ES3 parameters and it also serves as the electronic beam former. The software interfaces to the ES3 Head through the network cable and outputs the data to the data acquisition computer through the Power Data Interface. The software should be installed on a dedicated computer running Windows XP or Windows 2000. The computer used for the ES3 software should be at least a 2 Ghz Pentium IV. The faster the processor speed of the computer the higher the ping rate the ES3 will achieve.

With the introduction of software version 1.02.19 and after, the ES3 should be interfaced with a Motion Reference Unit. This will enable the ES3 to roll correct the ES3 data in real time. The data acquisition software must not apply roll compensation to the data but does have to correct for pitch and heave.

# 3 INSTALLATION

This section contains the information necessary to install the ES3 Control Software, to power-up the system and to connect the ES3.

## 3.1 Software installation

The minimum requirements for a personal computer to install and run only the ES3 software are:

- Windows XP or Windows 2000
- Pentium-IV, running at 2 GHz
- One COM-port (If connecting a sound velocity probe or GPS)
- One Ethernet port

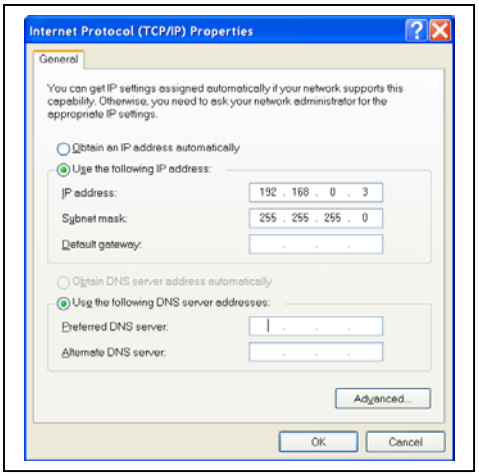
The ES3 program is fully tested on the following Operating Systems:

- Windows 2000
- Windows XP

The installation of the software on the PC is straightforward. The executable is called ES3**.exe**. It can be installed in its own directory, and run by double clicking, or you can create a shortcut from the desktop for it. We do not recommend using new program wizard or any other installation program. The program may start up either in playback mode or in real-time mode. If it is in real-time mode and the sonar head is not connected there may be a delay before the prompt comes back.

### 3.1.1 Network Settings for ES3 processing PC

The sonar head needs to run with a static IP (Internet Protocol) address for both head and PC. The IP address of the ES3 processing PC should be set to **192.168.0.3**. Also set the subnet mask to **255.255.255.0**. These settings can be found in the 'Network Connections' menu under 'Settings' in the 'Start' menu, and then click on properties of the LAN adapter, and properties of the TCP/IP. There is also a settings box for default gateway, but it can be left blank. For troubleshooting purposes you may need to know that the sonar head has IP address 192.168.0.2.


Internet Protocol (TCP/IP) Properties
General
You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.
Obtain an IP address automatically
Use the following IP address:
IP address:
192 . 168 . 0 . 3
Subnet mask:
255 . 255 . 255 . 0
Default gateway:
Obtain DNS server address automatically
Use the following DNS server addresses:
Preferred DNS server:
Alternate DNS server:
Advanced...
OK
Cancel

### 3.1.2 Network Settings for Data Acquisition PC

The IP address of the Data Acquisition PC should be set to **192.168.0.4**. Also set the subnet mask to **255.255.255.0**. Again, these settings can be found in the 'Network Connections' menu under 'Settings' in the 'Start' menu, and then click on properties of the LAN adapter, and properties of the TCP/IP. There is also a settings box for default gateway, but it can be left blank.

After the ES3 is installed and powered up the following settings should be verified before attempting to connect the data acquisition software to the ES3. In the ES3 software go to Profile Point Setup and make sure Profile Point Detection is enabled by clicking on the Enable button. Go to Data Output Setup in the ES3 software and make sure 83P is checked.

## 3.2 Setting up the equipment

The ES3 is a very compact unit designed for maximum portability. An interconnection diagram is shown in Figure 1. Care should be taken to route cables using horizontal and vertical runs wherever possible. Avoid paths that run adjacent to transmitter feeder cables or close to heat radiating elements such as steam pipes. For permanent installations, cables should be clamped at regular intervals (3 feet or 1 meter) along their complete lengths.

The ES3 requires an input voltage between: +9 and +30 VDC. The unit consumes less than 15 watts of power in normal operation.

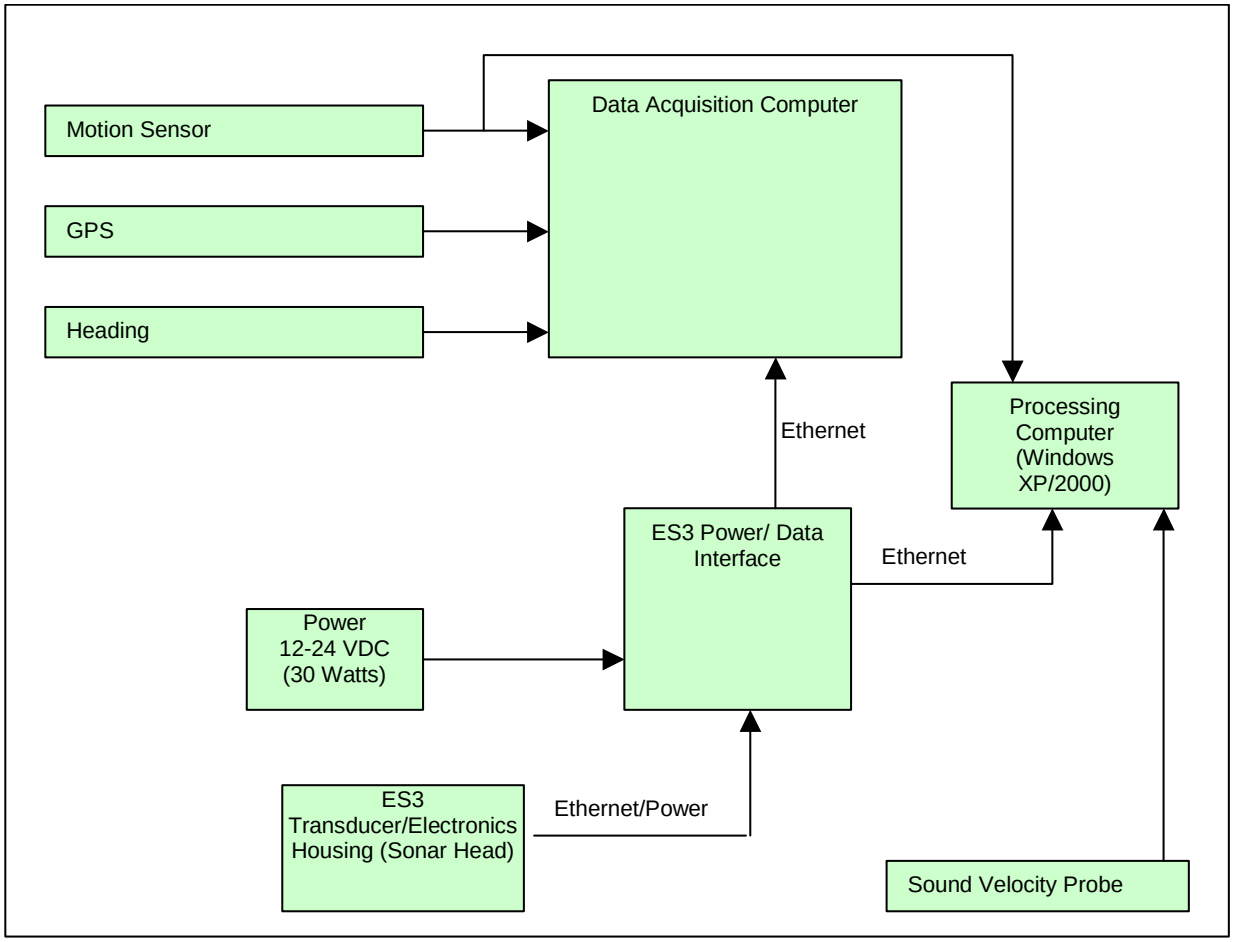



**Figure 1: Interconnection block diagram**

***Before connecting any of the cables***, make sure that the computer, the ES3 and other peripherals are turned off. The list below is a sequence of steps for connecting the ES3 with the computer.

a) Connect the cable from the ES3 Head to the connector on the ES3 PDI labeled “TRANSDUCER”.
b) Connect the power cable for the ES3 PDI to the connector labeled “POWER”.
c) Connect the UTP Ethernet cable from the ES3 PDI connector labeled Processing PC to the computer running the ES3 software (please note this should be a dedicated PC running no applications other than the ES3 control software.
d) Connect the UTP Ethernet cable from the ES3 PDI connector labeled Data Acquisition PC to the Data Acquisition Computer.
e) Connect the Motion Reference Unit to the ES3 computer.
f) If available connect the sound velocity probe to the ES3 computer.

## 3.3 Powering up the equipment

The following sequence must be followed when powering up the equipment:
1. Turn on the computer running the ES3 software.
2. Power up the ES3 by pushing the power button on the PDI. The red LED on the PDI should illuminate and the blue Link light should turn on when the ES3 Head starts transmitting data.
3. Start the ES3 Application program. Go to the file menu and then Data From…. Select Head. Data should appear on the main window.

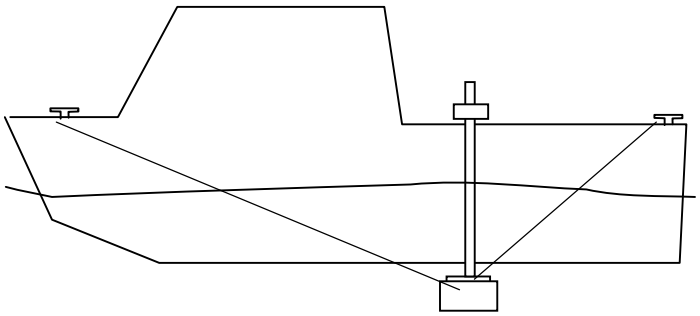
## 3.4 Transducer installation

Proper mounting of the transducer is a crucial part of the installation of any "survey" echo sounder. An improperly mounted transducer will result in poor system operation and unacceptable data quality.

### 3.4.1 Over the Side Transducer Installation

A mount of this type is frequently constructed from a length of pipe. This fixture should be sized to position the transducer well below the waterline and the pipe then fixed to a sturdy support on the vessel. Lines generally are attached at the mounting pipe and tied off fore and aft in order to maintain a stable, horizontal head attitude. Care should be taken to assure adequate protection for the transducer cable, particularly at the point where the cable leaves the transducer body. The position of the mounting assembly relative to other peripherals is critical for accurate data collection.

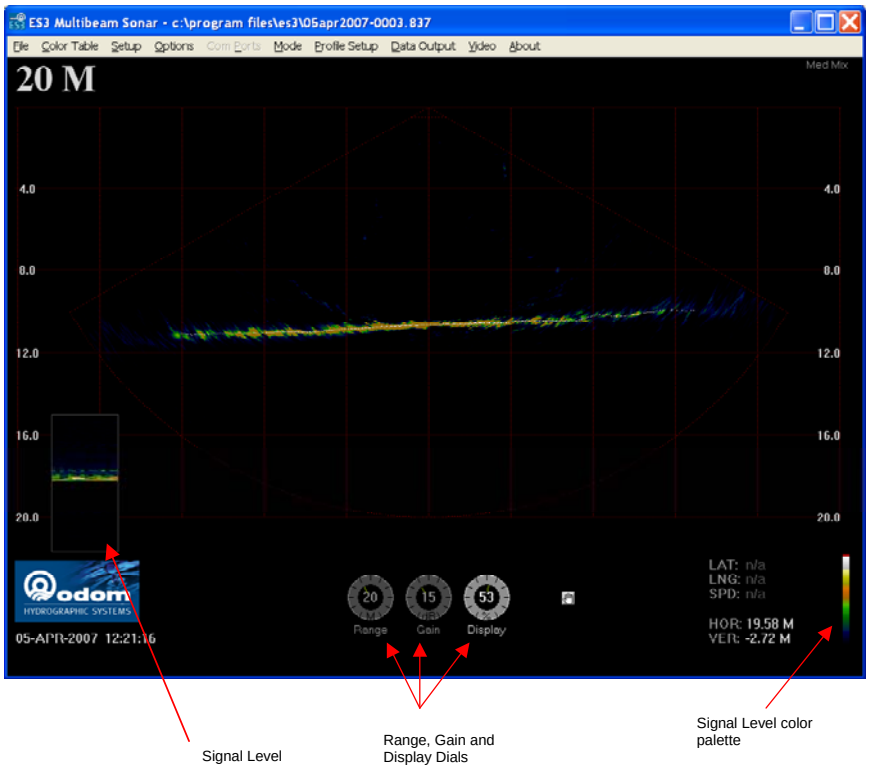
Particular care should be taken to assure that the transducer radiating face remains as parallel to the water surface as much as possible while the vessel is moving.



# 4 ES3 SOFTWARE

## 4.1 Introduction:

This section contains the information necessary to operate the ES3 using the ES3 control program. The ES3 control program is developed to provide the operator with complete control over the ES3 and is the beam former for the ES3.




ES3 Software

### 4.1.1 Range

The dial at the bottom of the ES3 main display sets the maximum slant range for the system. This is not the same as the maximum depth. The Range is the maximum distance to which any beam can reach. Since the ES3 is capable of up to a 120° swath the Range needs to be set to a higher number than the maximum depth value, so that the outer beams will be able to detect the bottom. A rule of thumb to set the correct maximum depth for the system is to set Range to twice the maximum anticipated water depth. **Note**: increasing the Range value will reduce the ping rate for the system due to the increase in travel time associated with the higher Range value.

### 4.1.2 Gain

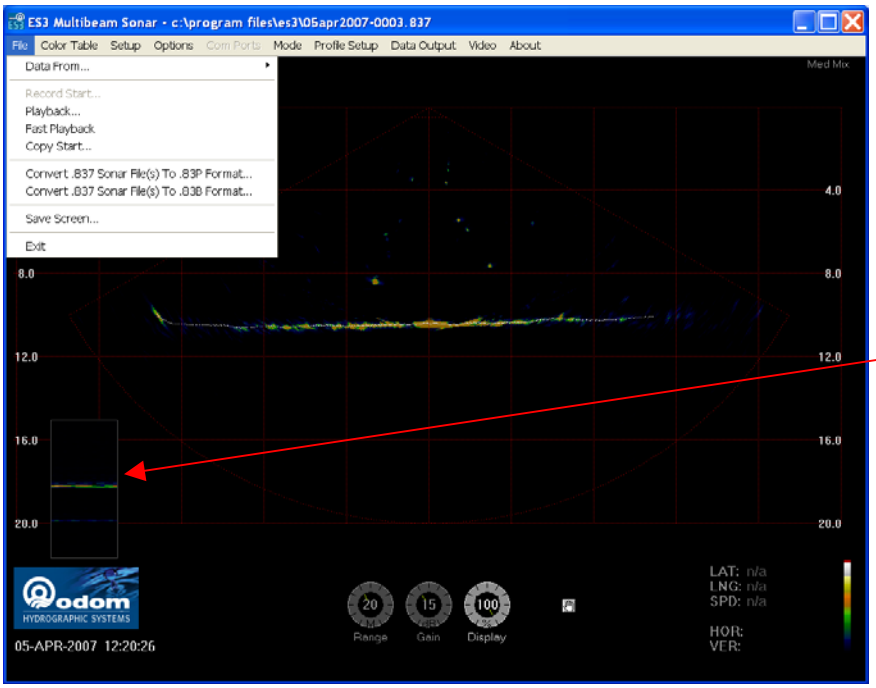
The Gain dial sets the gain for the pre-amplifiers inside the ES3 Head. Setting the Gain correctly is critical to the proper operation of the ES3. If the gain is set to high the signal will saturate and will not give accurate depths. If

the Gain is set at too low a value, there will be gaps in bottom detection. In order to set the Gain correctly, first make sure the signal window is open (below figure). Go to the Options menu on the ES3 software and confirm that the "Signal Level" block is checked. A window should appear on the lower left hand corner of the ES3 control display. The Gain is best adjusted in the work area where representative bottom conditions and depths are present. Increase the Gain slowly until red colors are visible in the "Signal Level" window. Once the red bars appear, reduce the Gain slightly until red is no longer visible.

### 4.1.3 Display Gain

Display sets the gain that is applied to the beam former in the ES3 software. As a general rule, set this parameter to 50%. If there is too much signal in the main window (multiple of the bottom and side lobe artefacts visible) reduce the Display Gain. If the signal from the ES3 is not reaching out across the entire swath, increase the Display Gain. The signal return seen on the ES3 software depends not only on the way the Gain and Display parameters are set, but also on the reflectivity of the bottom and the amount of attenuation present in the water column. It may not always be possible to achieve full swat coverage with the ideal settings because of these environmental influences.

### 4.1.4 File




#### 4.1.4.1 Data From

Selects data in real time or play back from a stored file. For real time select Head.

#### 4.1.4.2 Record Start

Starts recording raw data from the ES3 to a file that can be played back. This is useful for trouble shooting data as the recorded data can be sent to our office for analysis. It is also useful for trying out different filter settings to find the optimal setting for different work areas.

#### 4.1.4.3 Playback

Selects the file to play back. During play back the systems Range and Gain cannot be changed but all other settings can.

#### 4.1.4.4 Fast Playback

This lets the operator skip through the selected file during playback in larger steps to find a particular part of the data.

#### 4.1.4.5 Copy Start

Copy Start is for copying sections of files into a file with a different name and for subdividing long data-files.

#### 4.1.4.6 Convert .837 Sonar Files to .83P Format

#### 4.1.4.7 Convert .837 Sonar Files to .83B Format

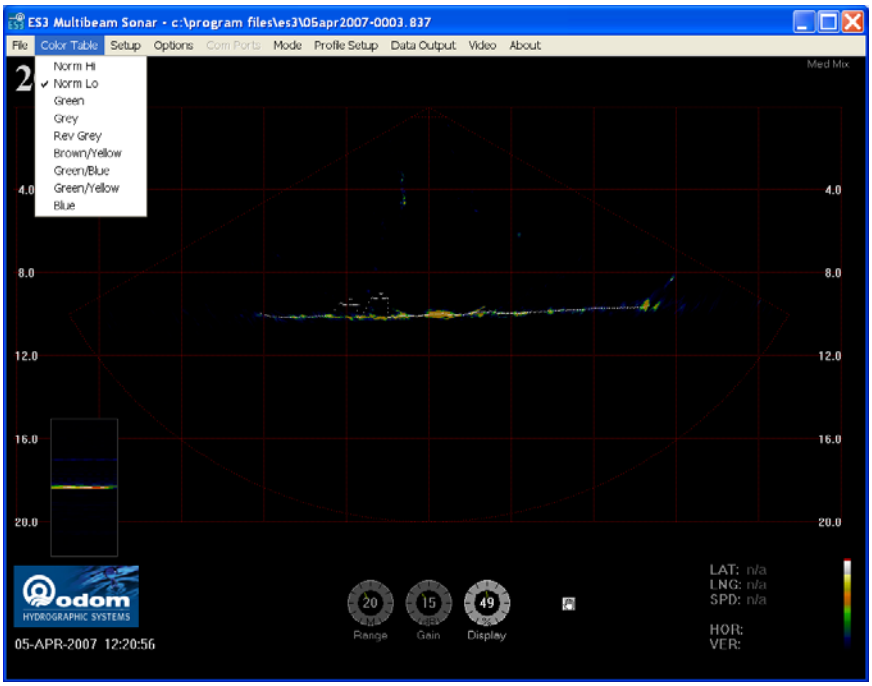
Raw Sonar files saved in real time are saved as .837 files. The above commands save the files for processing with other programs.

#### 4.1.4.8 Save Screen

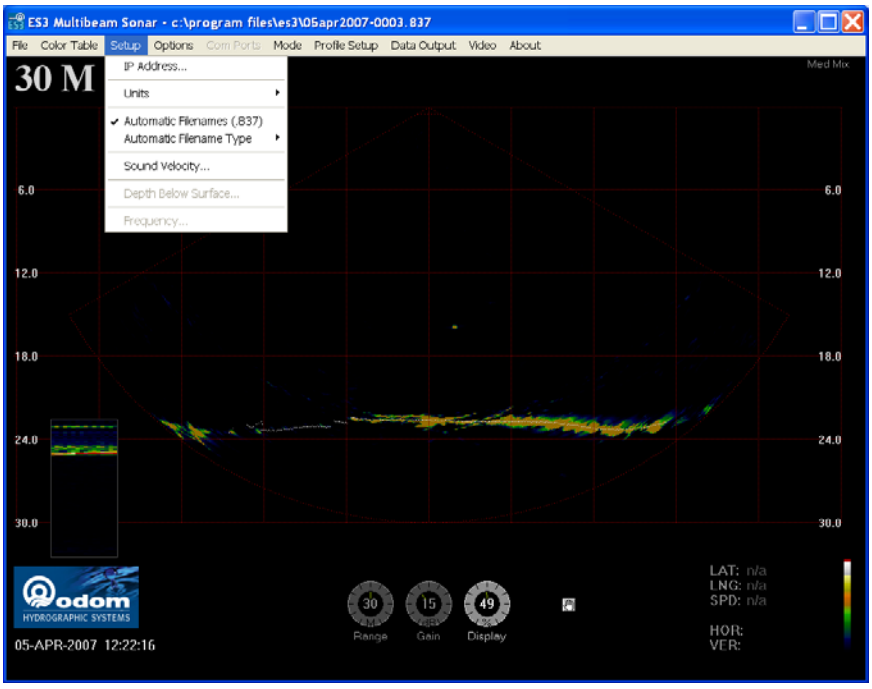
Save Screen is a screen capture command which creates a .BMP bitmap image of the current screen for inclusion into documents etc.

### 4.1.5 Color Table

The Color Table pull-down menu is for changing display colors. Single target detection is often best using the 'NORM HI' color table, while images of the bottom with shadows are usually best viewed in 'GREY' or 'BROWN-YELLOW'. These colors are for display only; the data can be played back with any color scheme if desired.




### 4.1.6 Set-up




#### 4.1.6.1 IP Address

The IP Address parameter sets the address of the Sonar Head and for the Ethernet data going to the data acquisition software. Normally the Sonar is set to 192.168.0.2. The Output IP address should be set to 192.168.0.4. These setting should not be changed.

#### 4.1.6.2 Units

Sets the operating units of the ES3. Select Meters or Feet.

#### 4.1.6.3 Automatic File Names

This lets the ES3 name the file names automatically based on the date and time they are created.

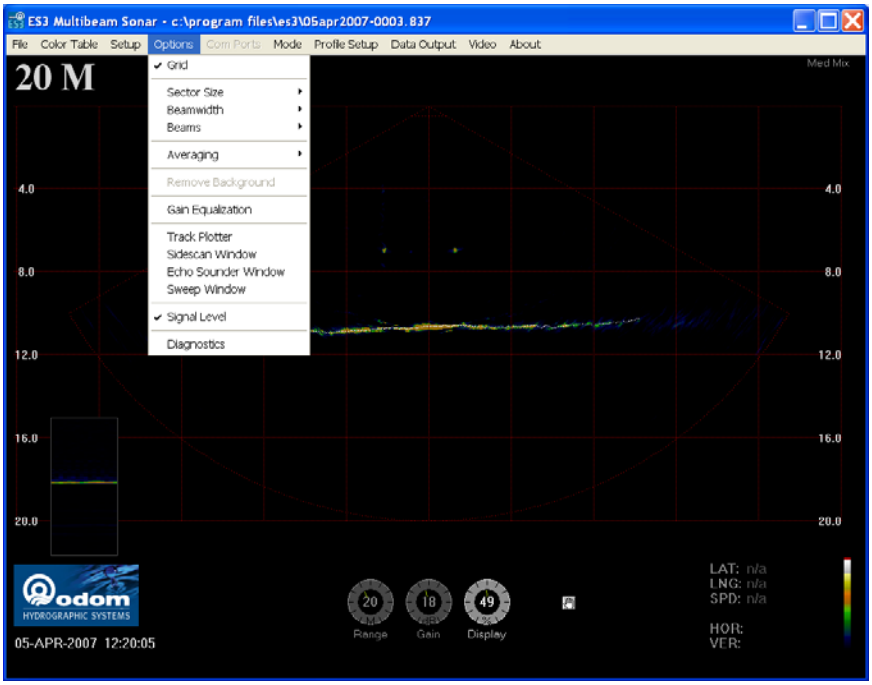
#### 4.1.6.4 Automatic File Name Type

This selects the automatic file naming convention.

#### 4.1.6.5 Frequency

Sets the operational frequency of the transducer. Normally set this to 240 kHz.

### 4.1.7 Options




#### 4.1.7.1 Grid

Adds a grid to the data display.

#### 4.1.7.2 Sector Size

Sets the total sector size the ES3 will measure. The larger the sector size the wider the swath coverage. The setting are 30° ,60° ,90° and 120°.

#### 4.1.7.3 Beam width

Sets the beam width of the individual beams in the ES3. Wide sets the beam width to 3°, Normal to 1.5°, Narrow to 0.75°. In the narrow mixed mode the ES3 will change the beam width automatically based on the setting of Range. As the Range parameter is set deeper the beam width will narrow. As the number of beams selected increases the beams will overlap each other.

#### 4.1.7.4 Beams

Sets the number of beams the ES3 will detect, display, and output. The options are 480, 240 and 120 beams. The larger the number of beams the better the across track resolution, but the slower the ping rate. For the highest ping rate select 120 beams.

#### 4.1.7.5 Averaging

Selects the number of pings that are averaged together before the data is output (along track average). The settings are from Off to 25 pings. A setting of 5 has been found to work well in a number of bottom conditions. A higher setting will work better on a very flat bottom with little debris on the seabed while a smaller number should be selected for maximum definition over rough bottom terrain.

#### 4.1.7.6 Remove Background

'Remove Background' can be used to display only the 'moving' targets of a static image. Press the 'Build Reference' button to begin generating a background reference image, then press 'Store Reference'. The background reference image will now be removed from the current image to produce an image with only 'new' or moving targets. This parameter is not used for Bathymetry.

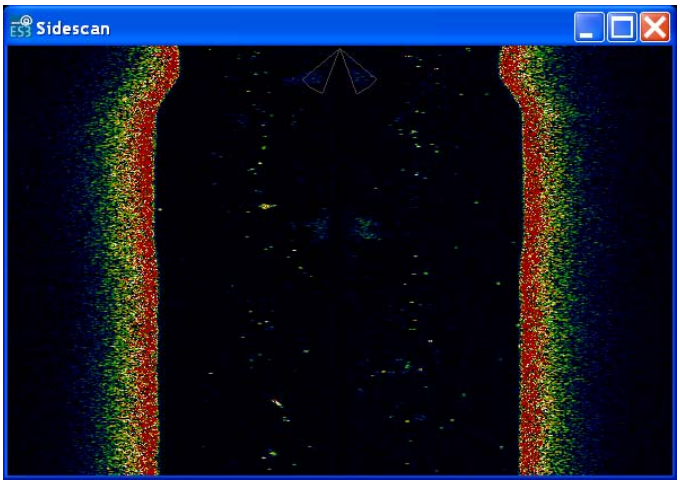
#### 4.1.7.7 Gain Equalization

Use this to normalize the gain across the swath.

#### 4.1.7.8 Track Plotter

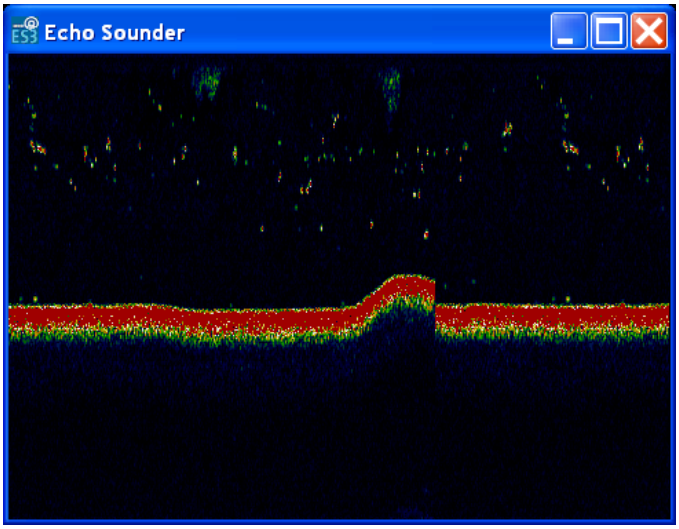
When a GPS is connected to the ES3 software the track plotter window will display a window showing the track the vessel has travelled.

#### 4.1.7.9 Sidescan Window



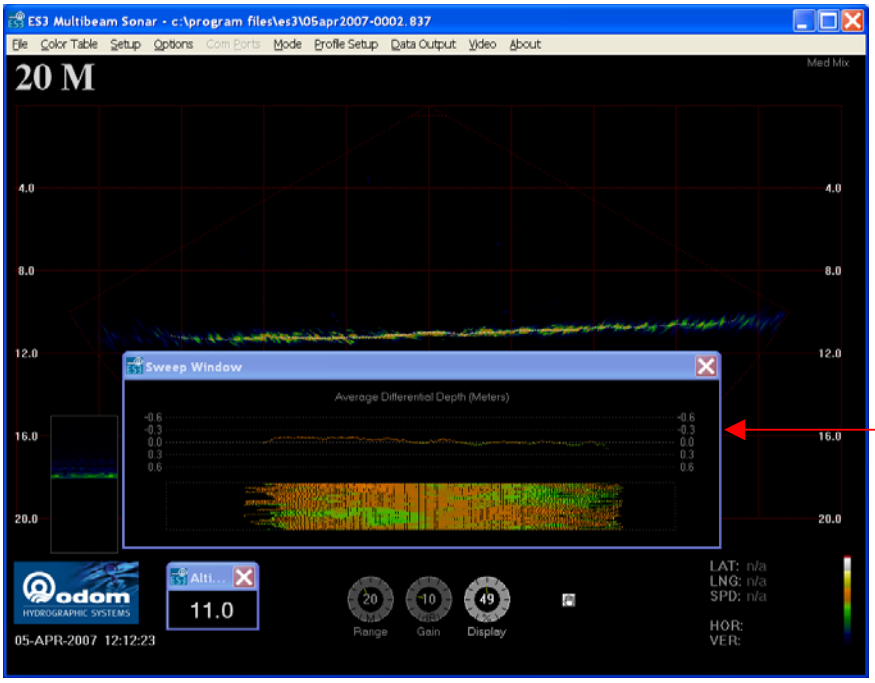

Opens up a window that shows the intensity data from the ES3. This intensity data is a low-resolution display of side scan data.

#### 4.1.7.10 Echo Sounder Window




Opens up a window showing the signal from the nadir beams like a single beam echo sounder.

### 4.1.7.11 Sweep Window



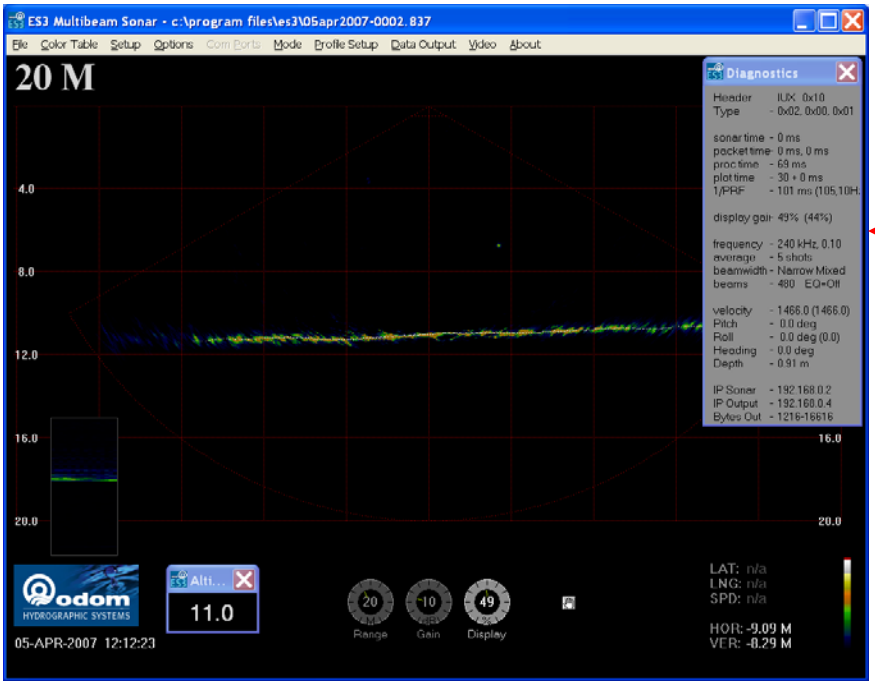

Sweep Window

Opens up a window displaying the last 25 pings averaged together. The window is useful to see the mean change in the bottom and to display outliers. Move the mouse cursor from left to right to get information such as the angle Minimum and Maximum for the last 25 pings. The vertical scale is fixed and cannot be changed.

### 4.1.7.12 Signal Level

Displays the signal level of the data coming from the ES3 transducer. The color scale is displayed on the far right. Adjust the Gain to that a minimum amount of red is displayed.

#### 4.1.7.13 Diagnostics




Opens a window that displays diagnostic information for the ES3. When the Motion Reference Unit is connected make sure the Pitch and Roll values are changing. Also make sure the velocity is changing if a sound velocity probe is connected to unit.

### 4.1.8 Com Ports

"Com Ports' is were the external sensors are interfaced to the ES3. The external sensors which can be interfaced to the ES3 include GPS receiver, MRU and Sound Velocity Probe.

#### 4.1.8.1 GPS

GPS positions can be recorded into the data file and viewed in the Track Plotter window in real time (or playback).

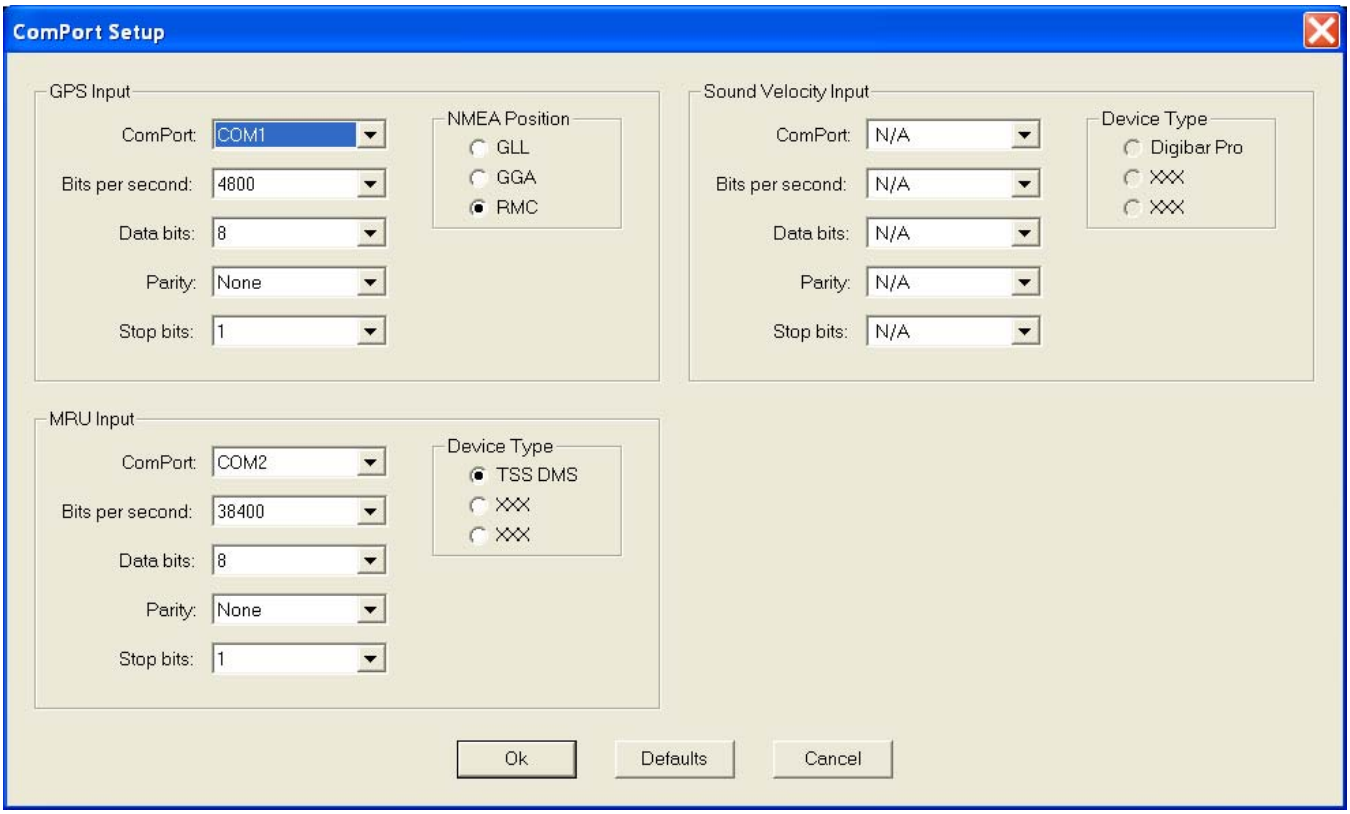
#### 4.1.8.2 MRU

The Motion Reference Unit is the most important external sensor input to the ES3. If a MRU is not interfaced directly to the ES3 the data will not be fully roll compensated. When the ES3 is receiving data from a MRU, the beams are roll compensated in real time. This means the data output to the data acquisition software will be roll compensated but still must be compensated for pitch and heave. If using the ES3 with Hypack make sure the ES3 driver used is later than September 6, 2007. The data string output from the MRU must comply with the TSS1 output format. To make sure the ES3 is accepting data from the MRU, open the diagnostic window and verify the heave, pitch and roll values are changing.

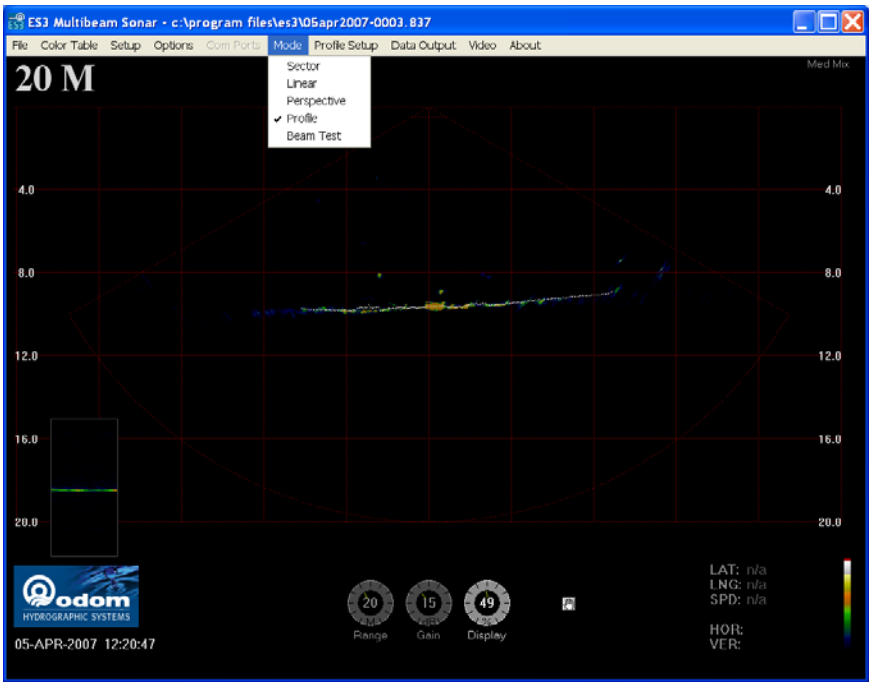
#### 4.1.8.3 Sound Velocity Input

The ES3 is able to accept real time sound velocities from a sound velocity probe attached to the head. This is important in areas where the sound velocity at the head is constantly changing as a result of temperature changes through out the day or salinity changes. The data must adhere to the AML format. To make sure the

ES3 is accepting data from the Sound Velocity probe, open up the diagnostic window and verify the velocity is changing. Note that the ES3 will convert the sound velocity to meters/second.

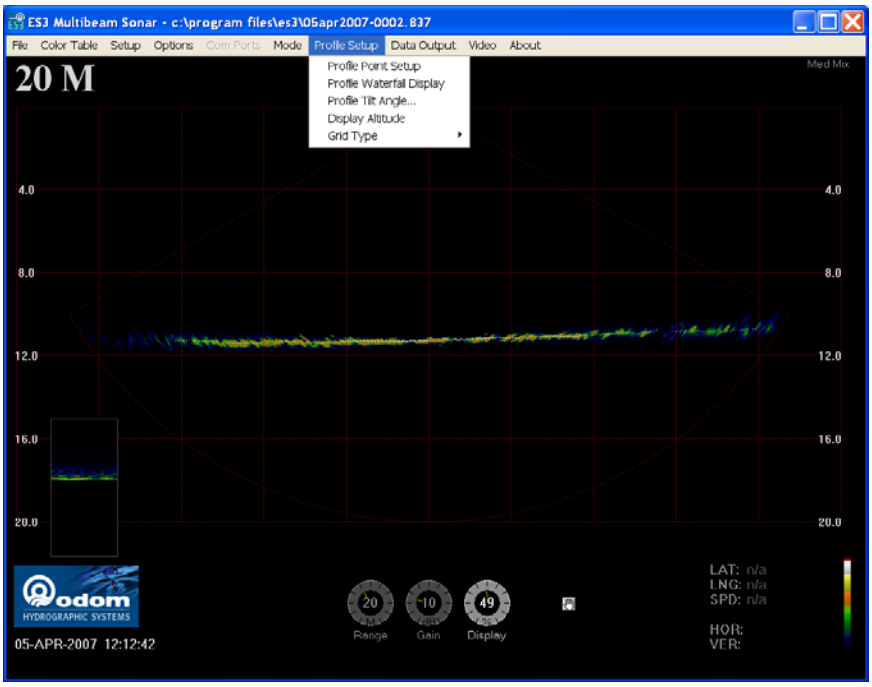


### 4.1.9 Mode




The 'Mode' pull down menu controls the different display modes. Again this does NOT affect the stored data so the data can be stored in SECTOR mode and played back in PERSPECTIVE mode if desired. BEAMTEST MODE simply shows the data from the individual channels without processing them into an image. The sonar will ping more rapidly in this mode, but the presentation is difficult to interpret. For bathymetry use the PROFILE mode to obtain the most information from the display.

### 4.1.10 Profile Setup




#### 4.1.10.1 Profile Point Display

This parameter sets the intensity of the signal in the main window. Low mix shows the lowest intensity and allows the operator to see the depth points. "Points Only" shows the depth points with no signal intensity information in the background.

#### 4.1.10.2 Profile Point Detection

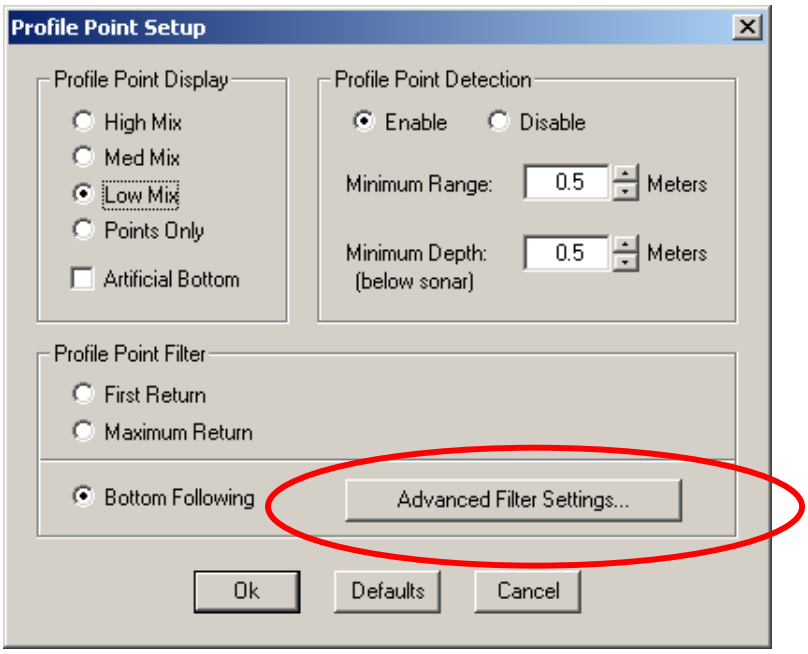
Always set the profile point detection to enable. This instructs the software to determine depth points. Minimum Range and Minimum Depth set the minimum detectable depth points below the transducer similar to a blanking level. Set both of these parameters to the same value.

#### 4.1.10.3 Profile Point Filter

Determines the detection mode for the ES3. For bathymetry we will nearly always select the Bottom following setting. The other options are First Return and Maximum Return. First Return will often cause the ES3 to detect objects in the water column. Maximum Energy will cause the ES3 to detect signals with the highest signal level (may or may not be the seabed).

#### 4.1.10.4 Advanced Filter Settings

There are numerous filter parameters which can be changed when using the "Bottom Following" profile point filter. To change these parameters, select the Advanced Filter Settings button in the Profile Point Setup dialog box.




All Filter settings are active in real-time or during file playback, so experimentation with these settings will not affect the stored data. The various filter settings may need to be changed depending on the bottom type and/or if there are targets on the bottom or in the water column (i.e. rocks, shipwrecks, fish schools, pilings, etc…).

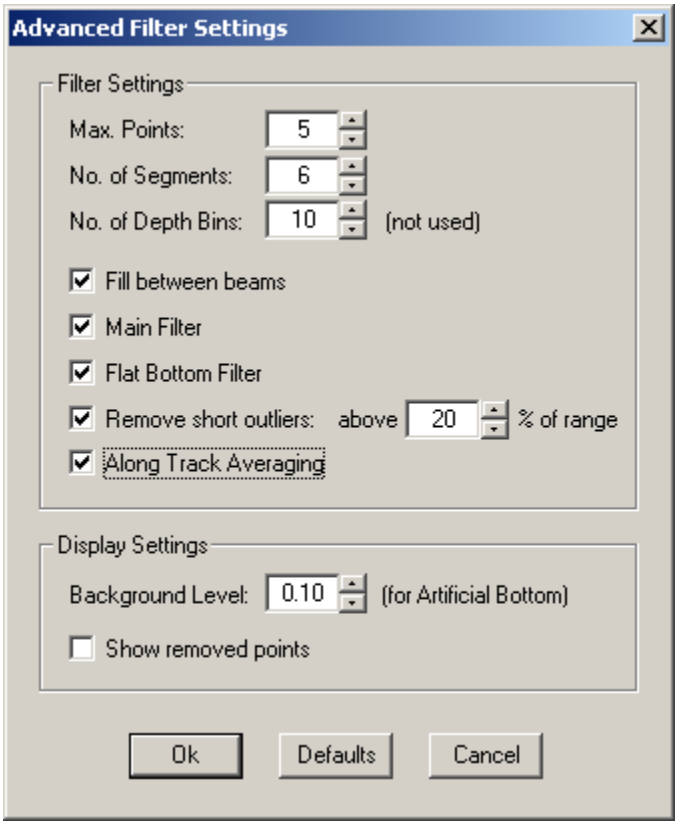


*Figure 2: Advanced Filter Settings dialog box*

**Max Points**
- the bottom detection filter detects up to “Max Points” and returns the range point with the highest summed power, assuming the bottom echo contains the highest power. A maximum of 10 points can be detected, however a setting between 2 and 5 will generate good results. Use a setting of 1 to detect all targets in the water column.

**No. of Segments**
- number of segments is used to help the filter work on complex bottoms (i.e. bottoms that are not flat). The bottom is divided into equal horizontal segments so the filter can act on smaller, less complex sections. Values between 3 and 5 produce good results for typical bottom types. A value of 1 could be used for a very flat bottom.

**No. of Depth Bins**
- not used at this time

The following sequence is a good starting point for experimenting with the various parameters (check the result of each setting before moving to the next parameter):

1. **Fill between Beams**
   - this setting generates a bottom range point for beams that don’t contain valid range to bottom values. The detected range points from adjacent beams are used for interpolating between the beams.

2. **Main Filter**
   - the main filter smoothes the detected range points and positions the points in the center of the returned pulse. This helps to generate a truer bottom profile specially on the outer beams where the grazing angle is such that the returned pulse can be scattered.

3. **Flat Bottom Filter**
   - the flat bottom filter reduces bottom artifacts directly beneath the transducer. All beams within +/-30 degrees of nadir are analyzed. Use this filter only if important vertical features such as pilings or seawalls are not present.

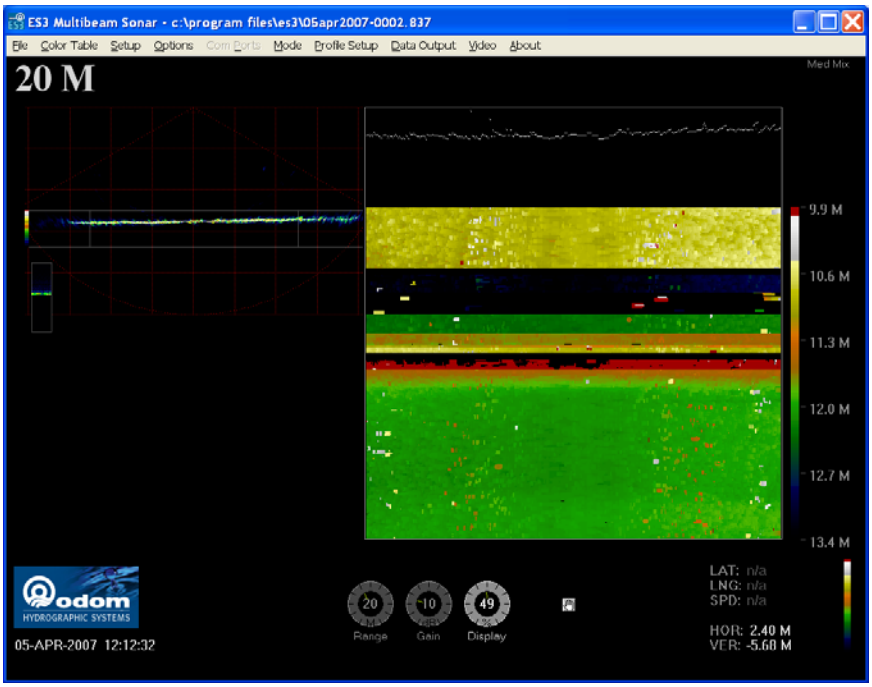
4. **Remove short outliers**
   - short outliers are unwanted targets above the bottom and in the water column. The “% of range” entry sets the effective “height off bottom” setting for the filter. This setting is entered as a percentage of the current range scale. For example, if the current range scale is 20m, a value of 20% would mean that all targets higher than 4m above the bottom will be removed. A setting of 20% can be used for relatively flat bottoms, lower settings can be used for very flat bottoms. Increase to 100% to keep all water column targets.

   Select “**Show removed points**” to display the removed points as enlarged green blocks (using the Norm Hi Color Table). Lower the “**Background Level**” setting to 0.1 or until the removed points are easily seen. This is a good diagnostic tool for evaluating the short outlier removal filter.

5. **Along Track Averaging**
   - this filter generates bottom ranges by averaging a number of consecutive pings.

It uses the same ping average setting as the Options | Averaging menu. Along track averaging can be used with any of the above filters.

### 4.1.11 Profile Waterfall Display




'Profile Waterfall' can be used to display consecutive cross-sections of the sea floor in a depth vs. color window. To change the depth to color ratio, position the cursor over the small profile image at the left side of the display and left-click to change the start depth then right-click to change the span.

#### 4.1.11.1 Profile Tilt Angle

Use 'Profile Tilt Angle…' to adjust the display if the sonar head has been tilted to look out to one side of the boat (valid tilt angles are – 30 to + 30 degrees).

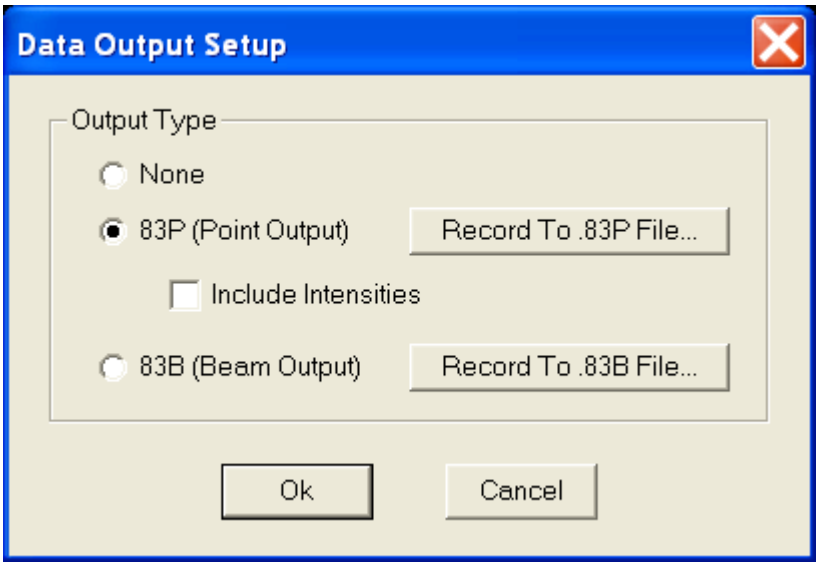
#### 4.1.11.2 Display Altitude

Opens up a window that displays the depth of the nadir depths.

#### 4.1.11.3 Grid Type

Changes the grid on the display from a circular grid to a rectangular grid.

### 4.1.12 Data Output Setup




Sets the type of data that is output from the ES3 computer to the data acquisition computer. The 83P File contains the bathymetry data. The 83B File contains the intensity data. For Hydrographic applications set this to 83P.

### 4.1.13 Video

The 'Video' pull down menu is used for displaying a video window from an optional video capture device such as a video camera plugged into a USB video converter (i.e. Adaptec AVC-1100 USB). Sub-menus include 'Open Video Window', Change Video Format', 'Record Enable', and 'Video Recording Rate'

### 4.1.14 About

The 'About' pull-down contains the software version number.

# 5 OPERATING INSTRUCTIONS

This section will instruct the operator how to quickly start gathering data from their ES3 multibeam. Follow the instructions in this section only once the rest of this operator manual has been reviewed and the ES3 is installed properly. It is assumed that the ES3 is connected correctly and all software is installed. To get more information on the parameters discussed go to the appropriate section of the manual. The instructions below are an initial setup and some parameters might have to be adjusted to work in specific areas.

1. Power up the ES3 PDI.
2. Start the ES3 software.
3. Go to the File menu and select Data From->Head.
4. Set the Units of measure, Setup->Units.
5. Set the maximum anticipated operating depth using the Range dial. Remember the dial indicates the slant range; so set the Range to twice the maximum water depth.
6. Go to Options->Sector Size and enter the desired sector size.
7. Go to Options->Beam Width and select the desired beam width, do not use the narrow/mixed mode.
8. Go to Options->Beams and enter the number of beams desired. Remember sector size and number of beams will affect the ping rate of the system.
9. Go to Options->Averaging and set this to 5.
10. Go to the Options->Diagnostic window. Make sure the MRU is connected and that the Pitch and Roll values are changing. If a sound velocity probe is connected, make sure the velocity number agrees with the reading from the probe. Note – is the sound velocity probe is outputting data in ft/sec the ES3 software will convert this value to meters/sec. This is normal.
11. Make sure the Signal Level window is active by making sure Options->Signal Level is checked.
12. Adjust the Gain (Center Dial) to that a minimum amount of red color is displayed in the signal level window.
13. Start out be setting the Display dial to 50%. If the whole swath width is not covered with data increase this percentage. If there is too much signal in the water column reduce the percentage.
14. If there is no sound velocity probe connected to the ES3 head Go to Setup->Sound Velocity and enter the Sound Velocity at the transducer face.
15. Go to Profile Setup->Profile Point Setup and check the following boxes: Low Mix, Profile Point Detection (Enable) and Bottom Following.
16. While in the Profile Point Setup window click on Advanced Filter Settings… and click on Defaults.
17. Start surveying after patch testing the system with the data acquisition software.

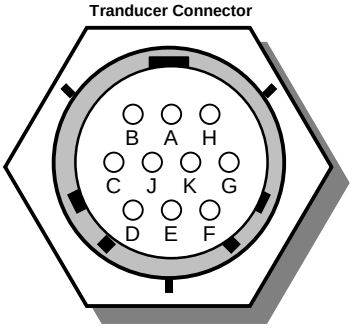
# 6 TROUBLESHOOTING

| Symptom | Solutions |
|---|---|
| No data in the ES3 software | 1. In the ES3 software go to File->Data From and make sure Head is selected.<br>2. Make sure the PDI is turned on and the Red power LED is on. If it is off check the power supply to the PDI.<br>3. Make sure the Blue Link light is on. If it is off check the power to the PDI and check the cable to the transducer.<br>4. Check is there is other network traffic colliding with the ES3. Disconnect everything to the ES3 PDI other than the ES3 computer, transducer and power. Switch off the ES3 PDI and reboot the ES3 computer. Power on the ES3 PDI and start the ES3 application. |
| No data in the data acquisition software | 1. Make sure the correct driver is selected for the ES3 in the data acquisition software.<br>2. Check section 3.1.2 of the manual<br>3. Check the network cable from PDI to the data acquisition computer. |

# Appendix A. CABLE CONNECTIONS:

**TRANSDUCER Cable Connector ( Signal Connector )**
P/N: MS3114E14-5S

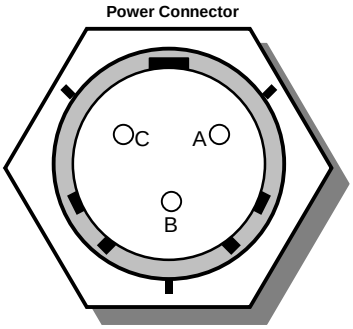
| Pin # | Description |
|---|---|
| A ---------- | Power Ground |
| B ---------- | +24 VDC |
| C ---------- | Ethernet TXD- |
| D ---------- | +24 VDC |
| E ---------- | Power Ground |
| F ---------- | Trigger Input+ |
| G ---------- | Ethernet RXD+ |
| H ---------- | Trigger Input - |
| J ---------- | Ethernet TXD+ |
| K ---------- | Ethernet RXD- |




Connectors as viewed from the PDI

**POWER Cable Conn. (DC only)**
P/N: MS3114E12-3P

| Pin # | Description |
|---|---|
| A ---------- | +12 or 24 VDC |
| B ---------- | No Connection |
| C ---------- | Return |



# Appendix B. Sound Velocity Input String

The ES3 will only read the AML string. This string is available from the Digibar Pro sound velocity probe and the format is as follows

In meters

<space>1477.40<CR><LF>

or in feet

<space>4847.40<CR><LF>

The default for the data protocol ASCII 19200,N,8,1. 19200.

# Appendix C. Configuring Digibar Pro to output data in real time

To set the Digibar Pro to output the sound velocity in real time set the following parameters in the Digibar Pro:

Setup -> Log basis -> Time
Setup -> Store cast data -> No
Comm -> Output Type -> AML
Comm -> Output During -> Yes

# Appendix D. Motion Reference Unit output string

The ES3 will only read the TSS1 output string. The format of the string is:

The TSS1 data string contains 27 characters in five data fields.

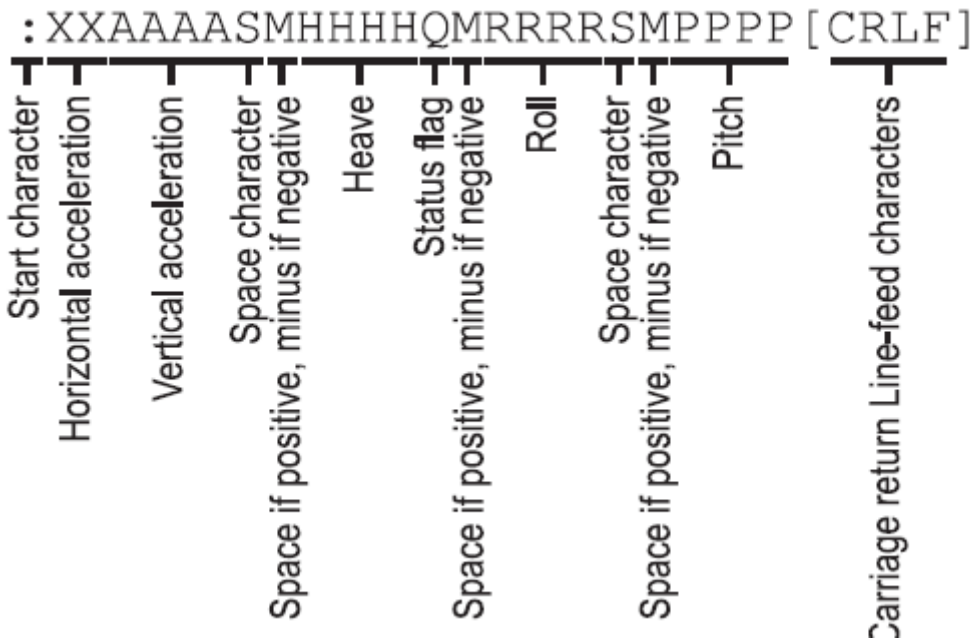
The acceleration fields contain ASCII-coded hexadecimal values. Horizontal acceleration uses units of 3.83cm/s² in the range zero to 9.81m/s². Vertical acceleration uses units of 0.0625cm/s² in the range –20.48 to +20.48m/s².

The motion measurements contained in the data string will be in real time, valid for the instant when the system begins to transmit the string.

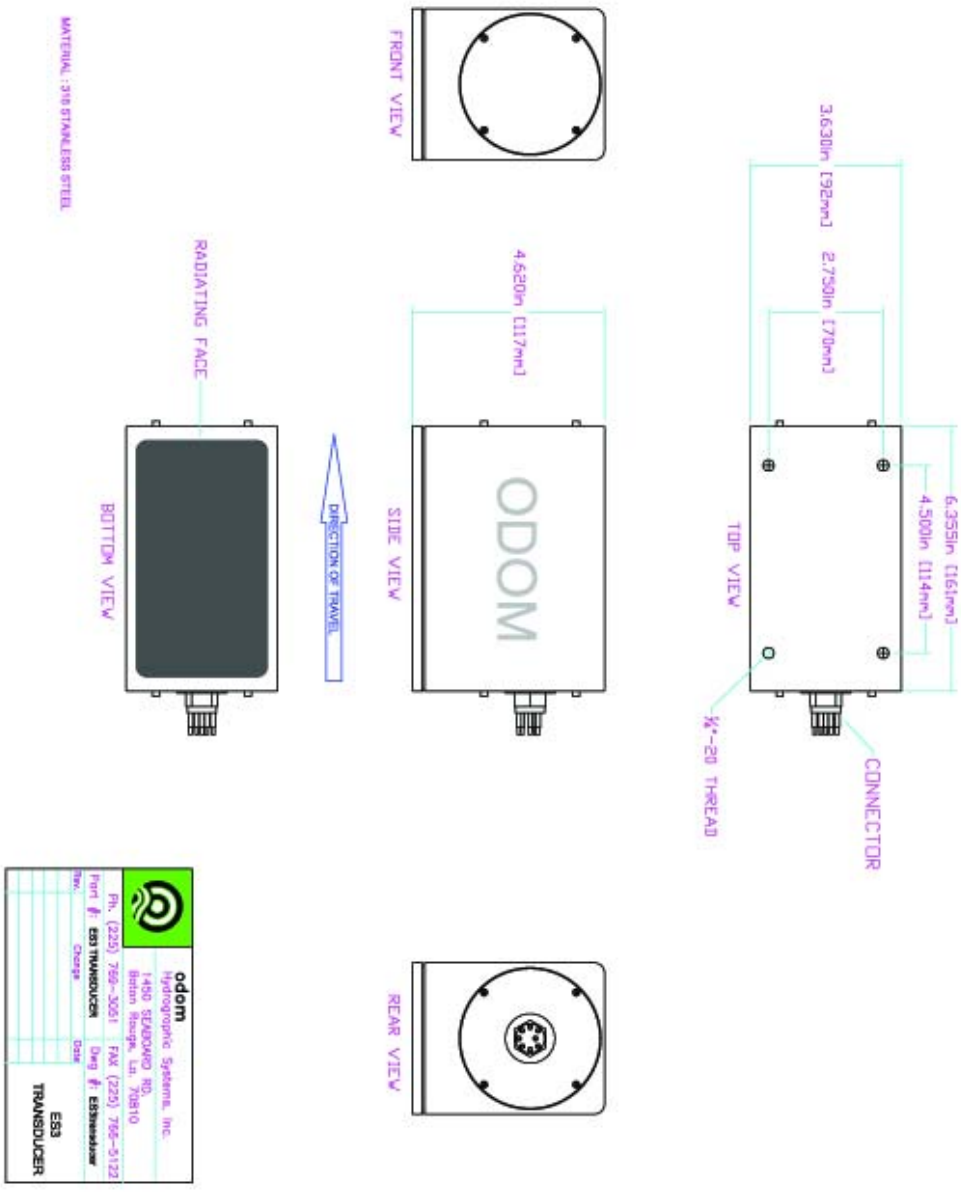
Motion measurements include ASCII-coded decimal values.

Heave measurements are in cm in the range –99.99 to +99.99 metres. Positive heave is above datum.

Roll and pitch measurements are in degrees in the range –90.99° to +90.99°. Positive roll is port-side up, starboard down. Positive pitch is bow up, stern down.



# Appendix E. Transducer Dimensions



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